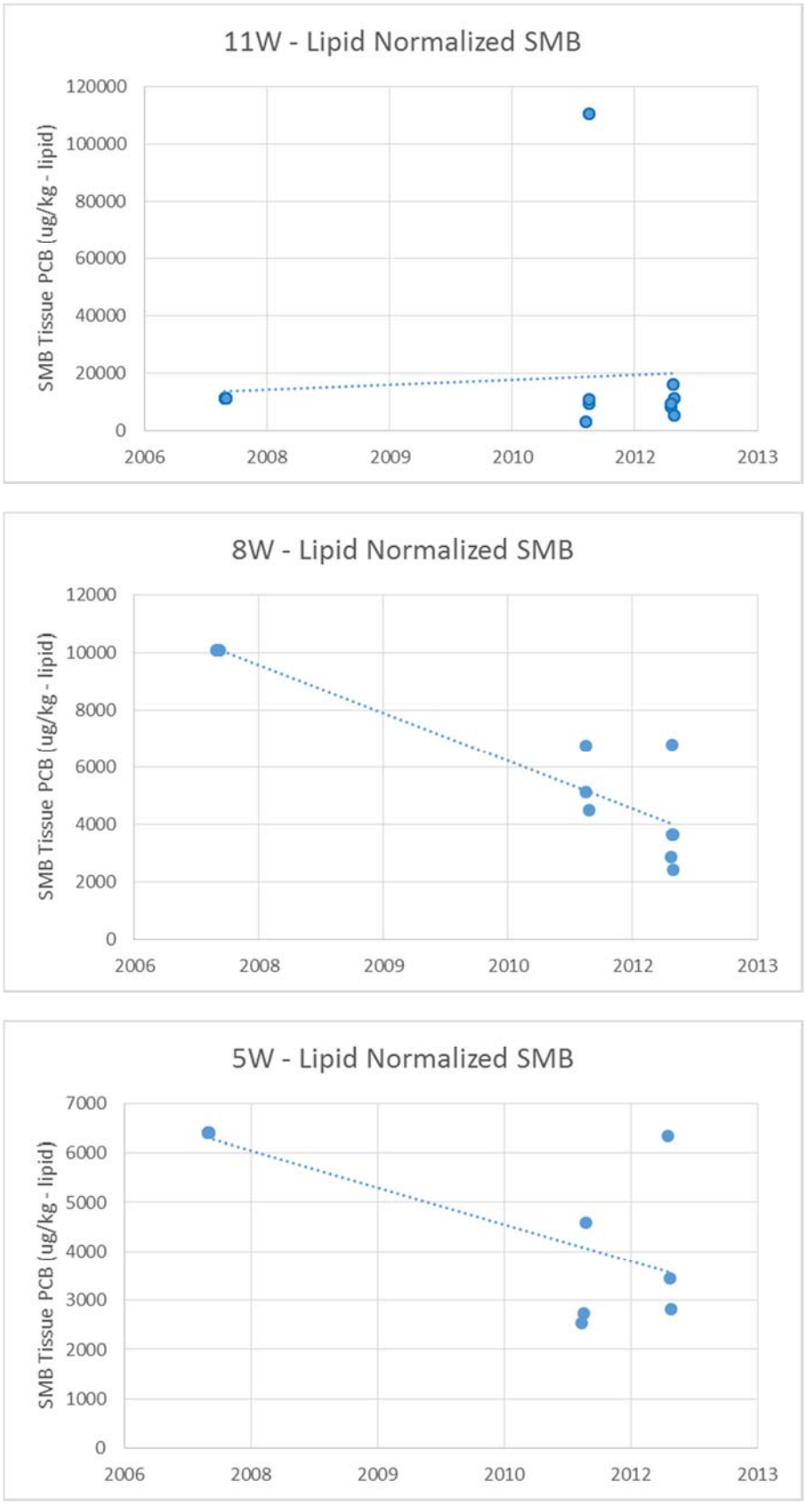
MNR Evaluation – Fish Tissue Contaminant Concentrations

Fish tissue were collected as part of the Portland Harbor remedial investigation (2002 and 2007) and in 2011 and 2012 to update contaminant concentrations in fish and assist in developing natural recovery trends. The most robust fish tissue data set exists for smallmouth bass and PCBs: Smallmouth bass were the only fish collected during all fish tissue collection efforts and PCBs were the only COCs analyzed in 2011 and 2012 fish tissue samples. There were some methodological inconsistencies between the surveys. For example, in 2002 individual fish were collected and composited from both sides of the river. In 2007, individual fish were collected and composited from one side of the river, while the 2011 and 2012 fish were analyzed as individuals. In 2011, the analytical laboratory contracted by EPA to process individual fish erred in the processing and approximately 75% of fish had to be discarded (instead of processing whole fish, the fish were prepared as skin-off fillets and the remaining carcass was discarded). Thus, the 2011 sampling effort only encompasses a few river miles.

These data were evaluated in several ways. First, the subset of fish tissue data (lipid-normalized total PCB concentrations in whole fish) with the most complete time trend are presented in Figures 1a-c. These are the areas where fish were collected in 2007, 2011, and 2012 (2002 samples were composited from both river sides and are not included). In these figures, the 2007 composite area (collection area of the individual fish included in the composite) is used and individual fish caught in 2011 and 2012 from within those areas is included. The figures depict declines in concentrations at 5 of the 6 areas. The statistical significance of these declines is not ascertained (see next section).

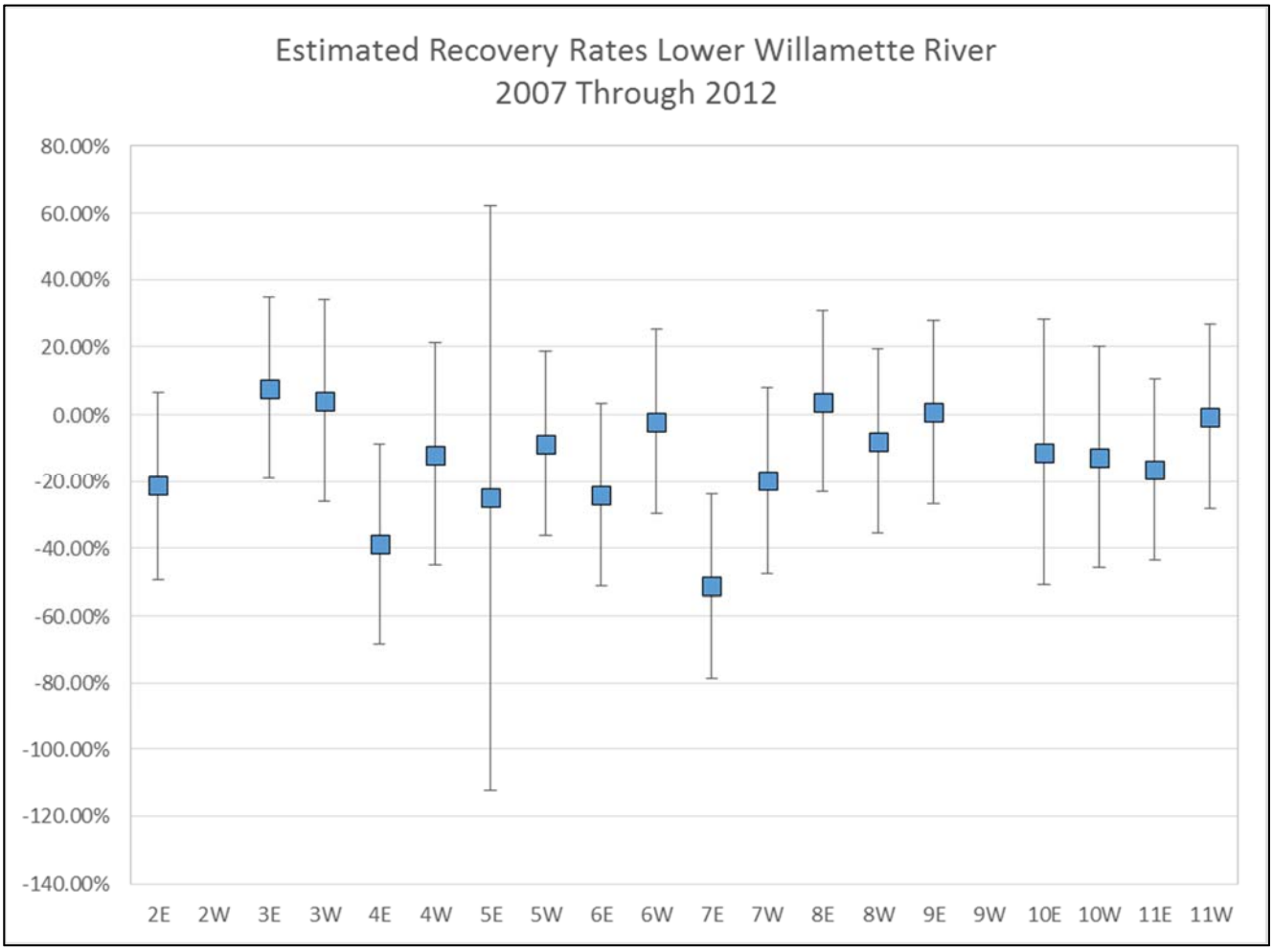
Following analysis of specific river reaches, the entire 2007-2012 data set (whole body fish analyzed for PCBs) was analyzed by side of river. Note that while 2007 and 2012 has extensive coverage, 2011 does not, so most river segments are assessed using only 2 time steps – 2007 and 2012. The annualized rate of decline resulting from this analysis, including error bars on the predicted decline is presented in figure 2. From this analysis, it can be shown that fish tissue PCB concentrations are generally declining. The annualized decay rate is averages approximately 13%, though the declines in only 2 of the 20 sub areas are significantly different than zero.

Overall, concentration data are suggestive of a decline but the small sample size, limited number of time points, and inconsistency in sampling methodology preclude a meaningful, statistically-valid determination the rate of decline. The certainty of results will be greatly enhanced through collection of additional monitoring time steps using standardized sampling, processing and analytical methods. The sampling design, sample preparation and chemical analysis methods used in 2012 should be considered as a template to be repeated for subsequent surveys.



Figures 1a-c. Whole body fish tissue PCB concentrations (Total PCB, lipid normalized) from river sections with samples taken in 2007, 20011, and 2012.

Figure 2. Annualized decay rate of fish tissue concentrations grouped by river mile and side of river



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